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Date of Application, 19th June, 1897

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PROVISIONAL SPECIFICATION.

Improvements in the Manufacture of Bread. (Malted)

I, WILLIAM GEORGE SMITH, of 106, Horseferry Road, Westminster, London, S.W., Baker, do hereby declare the nature of my said invention to be as follows:—

I select wheat for malting purposes, taking care to keep and work separately samples which are grown on different kinds of soils, and also to work the different
5 kinds by themselves, or the growth on the floor will be irregular. For instance, wheat grown on light soil grows more freely than such as is grown on cold clay or stiff land, and requires different treatment on the floor. If, however, sufficient care is not bestowed on the selection of samples, and growths of various soils are malted indiscriminately, the result will be that some of the grains will be half-
10 malted, while the other part will be thoroughly malted—a serious drawback in the manufacture of the complete article. For malting purposes it is essential that the wheat shall have been fresh threshed.

Before malting, the wheat should be thoroughly cleaned by passing it through the ordinary wheat-cleaning machinery, but care must be taken that such
15 machinery is not run at too high a speed; otherwise there is a danger of the embryo becoming ruptured or otherwise damaged.

Wheat suffering from smut or any other disease should be carefully avoided. This may be looked for when wheat has been harvested in a damp condition.

It is especially necessary that in the cleaning all foreign seed, such as cockles,
20 charlie, rape, and especially garlic, be completely eliminated, or the pleasant, nutty flavour, which it is so essential to retain, will be lost.

For the malting purposes, white Spring wheat of a standard quality, such as Talavera or Malaga, or any of the Talavera character, and plump both smooth and rough chaff wheat are equally suitable for the purpose of malting.

25 The wheat, having been cleaned and prepared, should be placed in a cistern and covered with water to a depth of six inches, as this will have the effect of keeping the whole steeping well under water. It should be kept in the cistern for a period of not less than thirty hours. Some kinds of wheat, when the grain is hard, will require to be steeped for 40 hours. Immediately the grain is
30 steeped, the operation of malting commences.

Within an hour after being put into water the germ-absorbing aqueous matter commences its existence. The exact mode in which the plant springs into life is, like other phenomena of this nature, not well understood. It is supposed, how-
35 ever, that at the base of the germ there are concealed the materials of the substance termed diastase, which, being acted upon by the steep-water, commences its vitality by converting the albuminous cotyledon of the grain into dextrine, which, by the continued action of the diastase, becomes sugar.

To produce the largest result with as little loss as possible should be the aim of the malster in this process of artificial vegetation.

[Price 8d.]

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During the time that the wheat is in steep it absorbs oxygen from the water, and throws out, in return, a quantity of carbonic acid gas.

To demonstrate the quantity of carbonic acid gas generated during steeping, if a small quantity of wheat be steeped in clear water in a glass vessel, the gas may be seen attached to the end of the grain, at the part where the awn is broken off, 5 in the form of a small globule.

Water from a lake or large pond is preferable to well water, as the rays of the sun have decomposed the animal and vegetable matter, and given rise to ammonia. The presence of ammonia in the water causes the grain to grow more freely and regularly than it otherwise would. If necessary to use well-water, a small amount 10 of fluid ammonia should be added.

The wheat having been sufficiently steeped (the grain should be kept in steep long enough to admit of the ends being brought almost together when pressed end-ways between the forefinger and thumb), the water is let off. In about half an hour the grain, when drained, is thrown out of the cistern with large wooden 15 shovels. When the grain is all thrown out, it is carefully levelled. The wheat should now be floored to the thickness of from eight to ten inches, or to such a thickness that the temperature will rise to from 50 to 60 degrees, which has the effect of starting the germination. The middle part of the floor, being the warmest, vegetates first. After a few hours the grain is turned or stirred, so as to 20 bring the top and sides into a similar state of forwardness. When the grain has made a start, it is laid a little thinner gradually until the middle of the process, when it is again thickened as gradually, until it is thrown on the kiln. During the process of artificial germination the temperature of the grain rises spontaneously. The reason of the grain thus engendering heat, is the absorption 25 of oxygen from the atmosphere, which contains nearly twenty *per cent.* of this element, and this, if not checked, would finally cause the wheat to burst into flame. This peculiar chemical action in germinating grain requires great attention. The heat sometimes rises so rapidly that, if not checked, it would rise at the rate of 30 two degrees in an hour.

The wheat is therefore turned according to the progress it makes in germination. In cold weather turning once or twice a day is sufficient, but in warm weather it should be turned as many as four or five times during the day.

Too great care cannot be observed in turning, as, by treading on the grain, it is more or less crushed, especially when laid out thin. To guard against this, 35 as far as possible, the malster should be provided with slippers. When a grain is crushed by the foot, its vitality is gone. In the early stage of germination it is a matter of great importance to prevent this, as the crushed grain is not only spoiled, but, immediately commencing to decompose and mould, has a tendency to communicate its bad effects to the surrounding grains. Grain, when vegetating 40 on the floor, should be perfectly free from any mouldy smell, as, if this odour be present, it always rises from some improper cause, to the deterioration of the malt. In watching the process of germination, one great feature must be borne in mind, *viz.*, that the grain should not be checked or heated suddenly.

When the grain has been on the floor about two days the rootlets begin to 45 appear; they are quite white. On the fourth day they will grow to the length of a quarter of an inch.

The grain in its young state absorbs a great quantity of oxygen, and throws out carbonic acid gas, which is the immediate cause of the spontaneous heat so necessary to hasten germination. This chemical action, termed "sweating," is 50 attended with loss of aqueous matter, during which the wheat often smells like apples in a store-room.

This action is attended with the development of alcohol, which I demonstrate as follows:—

Take some of the grain and submit it to heat in a retort on hot sand, or sand 55 bath, with a good condensing apparatus, when a small quantity of alcohol and fusil oil may be obtained. This accounts for the peculiar apple odour.

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When the grain has been sufficiently germinated on the floor, it is dried on a kiln, when the process of malting is finished.

As a general rule, the grain when about to be thrown on the kiln should be of such a nature that it may be easily broken or crushed between the finger and thumb, or when pressed and drawn along a board will break up and leave a white mark.

The object of drying the germinated grain upon the kiln is to preserve its saccharine quality, by dissipating the extra steeping.

This drying at a higher temperature than is necessary to promote growth also stops vegetation, and at such a point as is most desirable to the malster.

The lowest heat required to drive off the superfluous moisture and ensure its keeping must not be less than 105 degrees. The lower the temperature of the kiln the better, although the grain may require longer drying, as the saccharine matter is less liable to be converted into the chemical substance termed "caramel," familiarly known as burnt sugar.

When the grain is thrown on the kiln, it is spread evenly on the floor, the depth varying from four to sixteen inches. The time of drying varies from one to four days, according to the depth and the draught of air.

A good current of air is necessary in all kilns to carry off the steam. During the first six hours the heat should not exceed 70 degrees, the more gentle the fire is applied and raised the better. The gradual application of heat causes a slight germination for a few hours in that part of the grain which lies uppermost on the kiln. Under-drying should be as carefully guarded against as quick drying with a sharp fire, because the same bad qualities will attend it.

As the underneath part of the malt dries quicker than the top, it is turned as occasion may require.

Before the wheat malt is ready for grinding, the rootlets are removed. This is done by causing the malt to run down an incline made of wire-work, the wires being about the tenth of an inch apart. It is necessary to separate the rootlets from the malt, as they impart a disagreeable flavour to the flour.

The store in which the finished malt is kept should be perfectly free from damp, as the malt, having a great affinity for moisture, would absorb so much as to cause it to turn mouldy.

Having completed the malting, I now proceed to grind the malt and wheat by the ordinary gradual reduction process of the roller system.

I prepare the following mixture of wheat:—3 sacks of Red Wheat (English), Golden Drop, Chidham, or Nursery preferred; 3 sacks of White; 1 sack of No. 1 Duluth or Manitoba; and 1 sack of Saxonka or Walla Walla. The wheat having been well cleaned, I proceed with the grinding in the usual manner. As all flour, when milled, retains a certain amount of moisture, it will be necessary, before adding the prepared wheat malt, to thoroughly eradicate every vestige of moisture; otherwise it will be absorbed by the malt, to the detriment of its quality.

For this purpose, the flour must be dried at a temperature of 70 degrees C. (150 degrees F.). The heat at this temperature will show neither alteration in colour nor in the character of the gluten. If the proper temperature be exceeded, the flour loses its power of fermenting, and acquires an oily, rancid taste.

In order to manufacture the best flour, it is imperative that as much gluten as possible shall be included, and, as these gluten cells are situated between the starch cells and the bran, great care must be exercised in finally dealing with the bran. If the bran, after leaving the last reel, is carefully examined, the gluten layer, pericarp and episperm will be found still lying over one another, though in some cases this may have been torn apart. The bran duster should therefore be of such dimension as will furnish ample space and time for the final process of bran cleaning.

The flour having now been manufactured and dried, the malted wheat is reduced to flour by the same process, except that it is not necessary for it to pass through

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the dryer. Having done this, mix the flour and malt flour together in the proportion of one part malt flour to three parts of unmalted flour.

The following is my method of preparing the ferment and sponge for converting the flour into dough :—

For every sack of flour of 280 lbs. I prepare a ferment as follows :—

I thoroughly cleanse and boil 14 lbs. of potatoes. When cooked, I place them in a tub, which has been previously scalded out, and well mash them. I then add 2 lbs. of flour, $\frac{3}{4}$ lb. of dry yeast of good standard quality, and 20 quarts of water at about 82 degrees of Fahrenheit, well mix, and cover with a cloth.

Care must be taken that when once the ferment has been set, the tub must not be knocked or the contents agitated.

After the ferment has risen and subsided, I strain into the trough (with the pin-board in), add 20 quarts more water at 82 degrees Fahrenheit, and with about 56 lbs. of flour stir a batter or sponge. I let this rise once, which it will do in about two and a half hours.

I then dissolve, in 16 quarts of warm water, two and a quarter lbs. of salt, stir this into the batter, and with the remainder of the flour, make a firm, dry dough.

This should be allowed to lie for about half an hour, when it will be ready for the oven.

WILLIAM JORDAN,
120, Chancery Lane, London,
Agent for William George Smith.

COMPLETE SPECIFICATION.

Improvements in the Manufacture of Bread.

I, WILLIAM GEORGE SMITH, of 106, Horseferry Road, Westminster, London, S.W., Baker, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

I select wheat for malting purposes, taking care to keep and work separately samples which are grown on different kinds of soils, and also to work the different kinds by themselves, or the growth on the floor will be irregular. For instance, wheat grown on light soil grows more freely than such as is grown on cold clay or stiff land, and requires different treatment on the floor. If, however, sufficient care is not bestowed on the selection of samples and growths of various soils are malted indiscriminately, the result will be that some of the grains will be half-malted, while the other part will be thoroughly malted—a serious drawback in the manufacture of the complete article. For malting purposes, it is essential that the wheat shall have been fresh threshed.

Before melting, the wheat should be thoroughly cleaned by passing it through the ordinary wheat-cleaning machinery, but care must be taken that such machinery is not run at too high a speed; otherwise there is a danger of the embryo becoming ruptured or otherwise damaged.

Wheat suffering from smut or any other disease should be carefully avoided. This may be looked for when wheat has been harvested in a damp condition.

It is especially necessary that in the cleaning all foreign seed, such as cockles, charlie, rape, and especially garlic, be completely eliminated, or the pleasant, nutty flavour, which it is so essential to retain, will be lost.

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I then dissolve, in 16 qts. of warm water, two and a quarter lbs. of salt, stir this into the batter, and with the remainder of the flour make a firm dry dough.

This should be allowed to lie for about half an hour, when it will be ready for the oven.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. The improvements in the manufacture of bread, substantially as and for the purposes described.

2. In the manufacture of bread, the improved methods of selecting, preparing, and manipulating grain, substantially as and for the purposes described.

3. In the manufacture of bread, the improvements in the preparation of the ferment and sponge for converting the flour into dough, substantially as described.

Dated this 8th day of October 1897.

WM. JORDAN,
120, Chancery Lane, London, Agent for the Applicant.